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DATE: June 28, 2013

TO: Interested Parties

FROM: Joseph Douglas, Compliance Project Manager

SUBJECT: Walnut Energy Center Project (02-AFC-4C)
Staff Analysis of Proposed Modifications to the Back-up Water Supply

On January 21, 2011, Walnut Energy Center Authority filed a petition with the California Energy Commission to amend the Energy Commission Final Decision for the Walnut Energy Center. Staff prepared an analysis of this proposed change, and a copy is enclosed for your information and review.

The Walnut Energy Center project is a nominal 250-MW, combined-cycle power plant located in the City of Turlock in Stanislaus County. The project was certified by the Energy Commission on February 18, 2004, and began commercial operation on February 28, 2006.

The project was licensed to use up to 1,800 acre-feet per year (AFY) of recycled water. When recycled water was not available as the project commenced operation, the project was permitted to use potable water as a bridge supply until the recycled water became available. In 2005, the project was amended to allow the use of groundwater as a bridge supply and as a back-up in case of temporary interruptions in the recycled water supply. Because recycled water supply interruptions have been more frequent than anticipated, the proposed modifications in the attached Staff Analysis will allow Walnut Energy Center Authority to increase the back-up water supply limit of 51 AFY to 180 AFY when recycled water is not available. The maximum water volume the plant is licensed to use will remain at 1,800 AFY.

Energy Commission staff reviewed the petition, assessed the impacts of this proposal on environmental quality and public health and safety, and now proposes revisions to existing Condition of Certification **SOILS&WATER-5**. It is staff's opinion that, with the implementation of this revised condition, the project will remain in compliance with applicable laws, ordinances, regulations, and standards and the proposed modifications will not result in any significant adverse direct, indirect, or cumulative impacts to the environment (Title 20, California Code of Regulations, Section 1769).

The amendment petition and staff's analysis has been posted on the Energy Commission's webpage at http://www.energy.ca.gov/sitingcases/turlock/compliance/index.html. The Energy Commission's Order (if approved) will also be posted on the webpage. Energy

Commission staff intends to recommend approval of the petition at the August 14, 2013 Business Meeting of the Energy Commission.

Agencies and members of the public who wish to provide written comments on the amendment or staff analysis must submit comments to the Energy Commission Dockets Unit no later than July 31, 2013. Please include the docket number, 02-AFC-4C, in the subject line of your e-mail or first paragraph of your comments. Those submitting comments electronically should provide them in either Microsoft Word format or as a Portable Document Format (PDF) to docket@energy.ca.gov. Please include your name or the organization's name in the file name. Those preparing non-electronic written comments should mail or hand-deliver them to:

California Energy Commission
Dockets Unit, MS-4
Docket No. 02-AFC-4C
1516 Ninth Street
Sacramento, CA 95814-5512

All written comments and materials filed with the Dockets Unit will become part of the public record of the proceeding. Additionally, comments may be posted on the Energy Commission website. Questions about the staffs' analysis should be directed to Joseph Douglas, Compliance Project Manager, at (916) 653-4677 or by email to **jdouglas@energy.ca.gov**. If you desire information on participating in the Energy Commission's review of the project, please contact the Energy Commission's Public Adviser, at (916) 654-4489, or toll free in California, at (800) 822-6228. The Public Adviser's Office can also be contacted via email at publicadviser@energy.ca.gov.

News media inquiries should be directed to the Energy Commission Media Office at (916) 654-4989, or by e-mail at mediaoffice@energy.state.ca.us.

Enclosure: Staff Analysis

Mail List #7164

WALNUT ENERGY CENTER (02-AFC-4C)
Petition for Modification of Back-up Water Supply
EXECUTIVE SUMMARY
Prepared by: Joseph Douglas
June, 2013

INTRODUCTION

On January 21, 2011, Walnut Energy Center Authority (WECA) filed a petition with the California Energy Commission (Energy Commission) to amend the Energy Commission Final Decision (Decision) http://www.energy.ca.gov/sitingcases/turlock/notices/index.html for the Walnut Energy Center project (WEC or project). Staff has completed its review of all materials received.

The purpose of the Energy Commission's review process is to assess any impacts the proposed modifications would have on environmental quality and public health and safety. The process includes an evaluation of the consistency of the proposed changes with the Energy Commission's 2004 Decision, and an assessment of whether the project, as modified, will remain in compliance with applicable laws, ordinances, regulations, and standards (LORS) (Title 20, Calif. Code of Regulations (20 CCR), section 1769).

This analysis contains staff's evaluation of WECA's proposal to change Soil and Water Resources condition of certification **SOILS&WATER-5**.

PROJECT LOCATION AND DESCRIPTION

The Walnut Energy Center project is a nominal 250-MW, combined-cycle power plant located in the City of Turlock in Stanislaus County. The project was certified by the Energy Commission on February 18, 2004, and began commercial operation on February 28, 2006.

DESCRIPTION OF PROPOSED MODIFICATIONS

The project was licensed to use up to 1,800 acre feet per year (AFY) of recycled water. When recycled water was not available as the project commenced operation, the project was permitted to use potable water as a bridge supply until the recycled water became available. In 2005, the Energy Commission approved an amendment that changed the source of the back-up water supply from potable water to poor quality groundwater from WEC's on-site wells. The groundwater was also approved as a back-up water source for recycled water interruptions. Because recycled water supply interruptions have been more frequent than anticipated, the proposed modifications will allow WECA to increase the back-up water supply limit of 51 AFY to 180 AFY when recycled water is not available. The maximum water volume the plant is licensed to use will remain at 1,800 AFY.

NECESSITY FOR THE PROPOSED MODIFICATIONS

At the time of the 2004 Decision, the City of Turlock's Wastewater Treatment Plant ("WWTP") was undergoing improvements. Recycled water was not then available, but was expected to become available some time shortly after WEC was to commence commercial operations. The Energy Commission approved the use of potable water from the City of Turlock as an interim supply, or "bridge supply," for cooling, steam cycle make-up, and also as a back-up supply until the WWTP was able to produce sufficient quantities of recycled water. Once recycled water could be delivered, potable water was permitted for use as a back-up source of water in the event of a short-term interruption in recycled water delivery. The use of potable water as a back-up supply after the bridge supply period was limited to 51 AFY, calculated using a 5-year rolling average.

Since the City of Turlock has begun supplying recycled water to WEC, interruptions of this recycled supply to the WEC have been more frequent than anticipated. Thus this amendment allows the current groundwater usage limit of 51 AFY to be increased to a maximum of 180 AFY delivered to the project.

STAFF'S ASSESSMENT OF THE PROPOSED PROJECT CHANGES

The technical area sections contained in this Staff Analysis include staff-recommended changes to the existing condition of certification **SOILS&WATER-5** that would reduce potential impacts resulting from the proposed modifications to less than significant levels. A summary of staff's conclusions reached in each technical area are summarized in the **Executive Summary Table 1**, below.

Energy Commission technical staff reviewed the petition for potential environmental effects and consistency with applicable LORS. Staff has determined that the technical or environmental areas of air quality, biological resources, cultural resources, geological hazards and resources, facility design, noise and vibration, paleontological resources, public health, socioeconomics, traffic and transportation, transmission line safety and nuisance, visual resources, waste management, and worker safety and fire protection are not affected by the proposed changes, and no revisions or new conditions of certification are needed to ensure the WEC remains in compliance with all applicable LORS for these areas.

Staff determined, however, that the technical area of soil and water resources would be affected by the proposed project changes and has proposed revising Condition of Certification **SOILS&WATER-5** to assure compliance with LORS and to reduce potential environmental impacts to a less than significant level. The proposed revisions to Condition of Certification **SOILS&WATER-5** are provided in the Soil and Water Resources section.

Executive Summary Table 1
Summary of Impacts to Each Technical Area

TECHNICAL AREAS REVIEWED	STAFF RESPONSE			New or Revised Conditions of Certification Recommended
	Technical Area Not Affected	No Significant Environmental Impact*	Process As Amendment	
Air Quality	X			
Biological Resources	X			
Cultural Resources	X			
Geological Hazards & Resources	X			
Hazardous Materials Management	X			
Facility Design	X			
Land Use	X			
Noise and Vibration	X			
Paleontological Resources	X			
Public Health	X			
Socioeconomics	X			
Soil and Water Resources			X	X
Traffic and Transportation	X			
Transmission Line Safety & Nuisance	X			
Transmission System Engineering	X			
Visual Resources	X			
Waste Management	X			
Worker Safety and Fire Protection	X			

*There is no possibility that the proposed modifications may have a significant effect on the environment, and the modifications will not result in a change or deletion of a condition adopted by the Commission in the Final Decision or make changes that would cause the project not to comply with any applicable laws, ordinances, regulations, or standards (20 Cal. Code Regs., §1769 (a)(2)).

STAFF RECOMMENDATIONS AND CONCLUSIONS

Staff concludes that with its proposed changes to Condition of Certification **SOILS& WATER-5**, the following required findings mandated by 20 CCR, §1769(a)(3) can be made and recommends approval of the petition by the Energy Commission:

A. There will be no new or additional unmitigated, significant environmental impacts associated with the proposed changes;

B. The facility will remain in compliance with all applicable LORS;

C. The changes will be beneficial to the project owner because it will accommodate the interruptions in recycled water from the City of Turlock's WWTP; and

D. There has been a substantial change in circumstances since the Energy Commission certification, thus justifying the changes.

WALNUT ENERGY CENTER (02-AFC-4C)
Petition for Modification of Backup Water Supply
Soil and Water Resources Analysis
Prepared by: Abdel-Karim Abulaban
June 2013

INTRODUCTION

On January 21, 2011, Walnut Energy Center Authority (WECA or project owner) filed a Petition to Amend the Walnut Energy Center project (WEC or project). The project owner petitioned to remove the limit of 51 acre feet of groundwater per year (AFY) placed on the use of water from the backup supply as set forth in Condition of Certification **SOILS&WATER-5** (WEC 2011). In an e-mail communication on May 7, 2012 the project owner revised their amendment submittal and requested the use of up to 360 acre AFY. The proposed modification to the limit set on the quantity of water used for backup has a potential to impact the environment. The environmental impact aspects of the proposed amendment have been evaluated in accordance with the California Environmental Quality Act (CEQA) and current laws, ordinances, regulations, and standards (LORS).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS COMPLIANCE

Staff has reviewed the LORS identified in the Energy Commission's Final Commission Decision for the Walnut Energy Center (CEC 2004) and the Energy Commission's approval of a previous Petition to Amend Condition of Certification **SOILS&WATER-5** (CEC 2005). Since the new amendment does not introduce any changes in the methods used or sources of cooling water, but rather proposes to shift the amounts used from the previously approved sources of project water, the project is still subject to the same LORS that it was licensed under. In addition, no new LORS have been adopted since the licensing of this project that would have an effect on the scope of the analysis.

PROJECT DESCRIPTION AND BACKGROUND

WEC is a nominal 250 MW combined cycle plant (two combustion turbines with one steam turbine) located in the City of Turlock in Stanislaus County. WECA operates this facility as a baseload unit with an annual design availability range of 92-98 percent. The project is approved to use up to 1,800 acre-feet per year (AFY) of water for plant operations, with recycled water being the primary water source and local ground water being the backup water source. Approximately 97 percent of the power plant water demand is for cooling purposes in an evaporative wet-cooling tower.

Project recycled water is provided by the City of Turlock Wastewater Treatment Plant (WWTP) for cooling and steam cycle make-up of up to 2 million gallons per day (mgd), with a maximum annual usage of 1,800 AFY. Due to the fact that the project

commenced operations before the completion of the Turlock WWTP, the project was originally permitted to use potable water supplied by the City of Turlock to “bridge” the project to when the WWTP came on line. After WWTP recycled water became available for the project, potable water was used only for drinking, showers, fire service, sanitary and also as back-up in the event of an unexpected interruption in recycled water delivery. The original decision allowed the project to use up to 51 AFY of potable water for back up purposes based on the agricultural water demand of the 18-acre parcel that was retired for construction of the project. It was determined assuming an average agricultural demand of 3 AFY/acre and subtracting the 3 AFY the project was allowed to use for sanitary purposes.

Water use for WEC is divided into four main applications: 1) water for the circulating or cooling tower system; 2) service water for the plant, which includes fire water and all other miscellaneous uses; 3) demineralized water for makeup to the Heat Recovery Steam Generators (HRSGs); and 4) potable water for drinking and lavatory use.

In 2004 during project construction, the project owner petitioned to amend WEC’s license to forgo the use of potable water as the bridge and back-up water supply in favor of groundwater characterized by the project owner as being of poor quality, which is obtained from on-site wells extracting water from the shallow aquifer (TID 2004). The 2004 Petition to Amend was analyzed for potential impacts on the environment (CEC 2005). The analysis concluded that there would be no significant impacts from the proposed amendment if groundwater use for a backup supply was limited to 51 AFY. On January 19, 2005 the Commission approved the use of poor quality groundwater from WEC’s wells for both the bridge supply and as bridge and back-up during recycled water interruptions.

The project has been using a combination service/fire water storage tank for on-site potable water storage (total capacity of 250,000 gallons with 240,000 gallons reserved for fire service). There is also a second above ground storage tank for recycled water that stores 500,000 gallons. According to the project owner, the recycled water tank cannot be drawn below two thirds its capacity due to emergency requirements. Therefore, the available amount of recycled water in the full tank would be sufficient to meet project needs of cooling water for two hours at the maximum rate of 2 mgd. However, the average daily consumption of the project since it commenced operations has been under 1 mgd. Thus, the available portion of the storage tank should be sufficient to last the project approximately two hours in a typical case of an interruption in recycled water supply, assuming the water consumption rate is uniform throughout the operational hours of the year.

Since the usage rate is dependent on several factors, including the time of the day and other ambient conditions, it is expected to vary during the day and also the month and season of the year. This means that the available water that can be drawn from the tank may not last the project for two hours, but rather for a shorter time if the interruption happens to occur in a peak period of water need. Conversely, if the interruption occurs during times of lower demand for water then the available water in the storage tank

should last the project more than two hours. Thus the use of two hours as an average is a reasonable assumption.

Condition of Certification **SOILS&WATER-5** specifies that the 51 AFY limit is to be evaluated on a five-year rolling average basis. The total volume of groundwater pumping the project is permitted to use is thus 255 AF over any five-year period. However, WECA misreported the groundwater pumping in 2007, 2008, and 2009 which resulted in underreporting the actual use of 319 AF by 287 AF. The project has used a total of 453 AF in the five years since Condition of Certification **SOILS&WATER-5** was implemented, averaging 91 AFY, or 40 AFY more than what the project was permitted to use. **Soil & Water Resources Table 1** shows the annual groundwater use over those five years.

Soil & Water Resources Table 1
Walnut Energy Center Annual Groundwater Use

Operation Year	Reported GW Pumping (AF)	Actual GW pumping (AF)
Apr 2007/Mar 2008	16.7	167.4
Apr 2008/Mar 2009	7.4	74.4
Apr 2009/Mar 2010	7.7	77.4
Apr 2010/Mar 2011	109.1	109.1
Apr 2011/Mar 2012	24.1	24.1
Total		**453.4**
5-year Rolling Average (AFY)	**---**	**90.7**

The project owner stated that the reason for the exceedances was an error in the conversion factor that WEC technical staff used to convert gallons to acre-feet. They used a conversion factor of 3,258,500 gallons per acre-foot which is an order of magnitude larger than the correct factor of 325,850 gallons per acre-foot. Use of the wrong conversion factor resulted in reporting only one tenth of the actual amount of water used after converting to acre-feet. It should be noted, however, that the volumes reported in gallons were correct, and only the acre-foot numbers were wrong. The project owner was notified of the usage of the wrong conversion factor in a memo that was issued in April 2010 after review of the third annual water use report for April 2009/ March 2010. In the April 2010/ March 2011 annual water use report the owner used the correct conversion factor in the report. However, the project used more groundwater for that year than the previous two years (109 AF versus 77 and 74 AF).

ANALYSIS

Staff presents the following assessment of the project owner's proposed changes to Condition of Certification **SOILS&WATER-5**. The scope of this analysis is to evaluate the proposed increased use of shallow ground water for power plant cooling purposes and its potential to adversely affect soil and water resources from its production,

delivery, use, and discharge. Staff reviewed the project owner's petition to identify potential environmental impacts to soil and water resources and for consistency with applicable LORS. This analysis is based on information provided in the original Final Staff Assessment (FSA) for the WEC Application for Certification (CEC 2003), and the Energy Commission's approval of the 2004 Petition to Amend Condition of Certification **SOILS&WATER-5** (CEC 2005).

The proposed modification does not require any additional construction or land use, nor does it result in an increase in the operation of the project. The project owner believes the amendment will not result in any impacts to any environmental areas other than water resources.

As stated by the project owner, the proposed modification is necessary to facilitate a reliable back-up water source for the project. At the time of certification, it was believed that the City of Turlock would be able to reliably provide sufficient recycled water with few interruptions, and that WEC would not need to back-up this supply at a level greater than 51 AFY. However, since the WWTP began supplying recycled water, interruptions of recycled water deliveries have been more frequent than anticipated, and WEC's use of the well water for back-up water has exceeded the 51 AFY limit the project is permitted to use for back-up purposes on a five-year rolling average basis. Use of poor quality groundwater pumped from WEC's wells is preferable to the use of higher quality potable water from the City of Turlock, and there are no other sources of water to back up the City's recycled water supply.

GROUNDWATER SUPPLY

Groundwater in the project area exists in two aquifers: a confined aquifer below the Corcoran Clay aquiclude, and an unconfined aquifer above the Corcoran Clay. The unconfined aquifer varies in thickness, but in the power plant area the maximum thickness is about 250 ft. (TID, 2004 - Appendix A, Figure 3).

Both the confined and the unconfined aquifers are used for domestic water supply and constitute the groundwater basin in the Turlock area. WECA owns and operates three wells at the site which pump water from the unconfined aquifer with screens at depths of 50 to 150 feet below ground surface (bgs) according to the study prepared for the owner by Timothy J. Durbin, Inc. in 2004 and submitted as Appendix A to the petition for Amendment # 2 (TID 2004). Turlock Irrigation District (TID) owns and operates 78 wells that also pump from the unconfined aquifer within a four-mile radius of the site. The screens in these wells typically begin at 127 ft bgs and can be as deep as 250 feet bgs or deeper. TID uses the wells primarily for drainage purposes to lower the water table (i.e., dewatering) below the root zone of crops that have typically been irrigated with an imported surface water supply over the past several decades. The project owner submitted TID information that shows the drainage pumping to be as much as 1,000 times the pumping rates of the WEC supply wells. The information also showed that drainage pumping takes place for about nine months of the year on average, from the beginning of March through November, while the WEC pumping is roughly spread throughout the year, with no consistent trend.

In addition to the TID dewatering wells, there are about 600 domestic water supply wells in the unconfined aquifer within a radius of four miles of the power plant. Most of the domestic wells are completed in the unconfined aquifer at an average depth of about 160 ft bgs, while the City water supply wells pump from the deep, confined aquifer. As was pointed out in the Final Staff Assessment (FSA) of the Application for Certification (AFC), the groundwater resources in the Turlock area are in overdraft (CEC 2003). The 2008 Groundwater Management Plan of the Turlock Groundwater Basin estimated that between 1997 and 2006 the storage in the groundwater basin had decreased at a rate of 21,600 AFY (TID, 2008). Most of the pumping occurs in the confined aquifer where the City of Turlock's wells are screened and the City prohibits any other pumpers from constructing wells in the confined aquifer. There is no recent information that indicates the declining trend has changed. Thus, it is safe to assume that the groundwater basin is still in deficit. Substantial increases in use of groundwater for the project could contribute to this ongoing decline.

Groundwater quality varies within the power-plant area. Water quality data for the unconfined aquifer are limited. Data on groundwater constituents were submitted as part of an appendix to the petition for amendment submitted by the owner in 2004 to amend the bridging water source for the period before the WWTP was operational. Water quality data came from three wells located to the south and southwest of the power plant, however, no information is available on the sampling depths.

The submitted information on water quality indicated that dissolved solids range from 420 to 720 milligrams per liter (mg/l), and nitrate concentrations range from 64 to 149 mg/l. These nitrate concentrations exceed the Maximum Contaminant Level (MCL) of 10 mg/l for drinking-water in California (California Code of Regulations, Title 22). The fact that the samples were collected from the WEC supply wells which draw water from depths between 50 and 150 feet suggests that the data likely represent concentrations in the unconfined aquifer at roughly the same depths.

However, a United States Geological Survey (USGS) study (Landon, M.K., et al., 2010) of groundwater quality in the central eastside San Joaquin Basin, which includes the project area, shows that nitrate levels below 200 feet (ft) bgs are less than half the MCL, or 5 mg/l. The same study also showed that for depths between 100 and 200 ft bgs, the nitrate levels are roughly equal to the MCL, with only a few exceptions where the nitrate levels were greater than the MCL, but they did not exceed twice the MCL. It should be noted that the USGS study was for the entire groundwater basin, while no site specific information was available for the aquifer area in the vicinity of the project site.

The distribution of nitrates with depth within the aquifer shown in the USGS study is consistent with the principles of nitrate transport in groundwater. Concentrations tend to be higher close to the source of the nitrates and gradually decrease away from the source. The source of nitrates here is believed to be the ground surface where it is applied as a fertilizer. Pumping of the WEC wells has the potential to enhance vertical movement of nitrates which result in degradation of the water quality at depths at or below 50 feet where the WEC wells are screened. This fact was also pointed out in the

FSA (CEC 2003). Staff inquired if WECA had water quality data for the power plant wells in order to examine the vertical distribution of the nitrates in the aquifer. The project owner submitted some water quality data that staff found of limited use as it did not include nitrate concentrations in the WEC pumping wells, nor did it include information on the vertical distribution of nitrate concentrations in the vicinity of the WEC pumping wells.

In order to assess the potential impact of the proposed pumping on the water quality of the deeper portions of the unconfined aquifer, staff ran a two-dimensional groundwater model with some simplifying assumptions. The USGS MODFLOW model was used for this purpose. The simulation used hypothetical parameters and boundary conditions that are thought to approximate the conditions beneath the project site. Several scenarios were considered to represent the irrigation water application and the added pumping of the project. It was assumed that the upper 5 feet of the soil profile have a constant nitrate concentration throughout the year, which is reasonable given the fact that agricultural practices have been going on for several decades in the area. Irrigation water was assumed to be 3 AFY/acre, which is on the low end of typical values since typically about five AFY/acre of water is applied for irrigation in the area. Irrigation water was assumed to be applied for three months of the year. The pumping rate was assumed to average 200 AFY.

For this scenario, there was an obvious trend of migration of nitrate-laden water from the upper portion of the aquifer to the lower portions. The model runs showed that the upper 150 feet of the unconfined aquifer would be completely mixed after a few years of this practice, even if it was completely clean prior to the beginning of the application of irrigation water and drainage pumping. The mixing would have been enhanced further if the typical amount of irrigation water of 5 AFY/acre were applied at the surface.

In light of the model results, staff concludes that the upper aquifer is likely to have been almost all but completely mixed and water quality has already been significantly degraded in the project area, at least above the level of the pumping well screens that begin at an average depth of approximately 150 feet bgs. Therefore, it is unlikely that the limited pumping of WEC wells would further contribute to a significant water quality impact. If a limited increase in WEC groundwater pumping would replace pumping that would otherwise be required for TID dewatering then the potential impact would also be incrementally reduced. Staff points out that this conclusion is only based on a limited increase in WEC groundwater pumping because of concern that if more pumping were concentrated at the WEC wells and less at the offsite TID drainage wells spread across the agricultural development area, significant upwelling could be induced in the area of the site and higher quality groundwater may flow into the mixing zone and become degraded. Staff also concludes that since the WEC groundwater pumping would likely replace and thereby reduce the volume of water needed for TID dewatering there would be no significant net increase in groundwater pumping that would exacerbate overdraft conditions.

Striking the limit of 51AFY from the condition of certification as initially requested by the petition to amend (WECA, 2011) and allowing groundwater pumping up to 1,800 AFY or the revised 360 AFY could result in a substantial increase in groundwater pumping concentrated at WEC's three project wells. Staff believes that given the above characterization of water quality in the regional aquifers and lack of water quality data from existing project wells, it is appropriate to adopt a conservative position and conclude that increased pumping beyond what is necessary from WEC wells could degrade water quality and result in significant impacts to other groundwater users. Staff notes that if a site specific investigation and analysis show this not to be the case then the analysis can be revisited and some form of mitigation may be possible. Staff does conclude that some additional groundwater pumping beyond the 51 AFY approved based on previous use on the agricultural acreage (CEC 2003) may be allowable. Given the potential for water quality impacts to other users and the lack of data provided by the owner, staff believes the allowable increase must be limited to that reasonably required to maintain dependable operations.

RECYCLED WATER SUPPLY

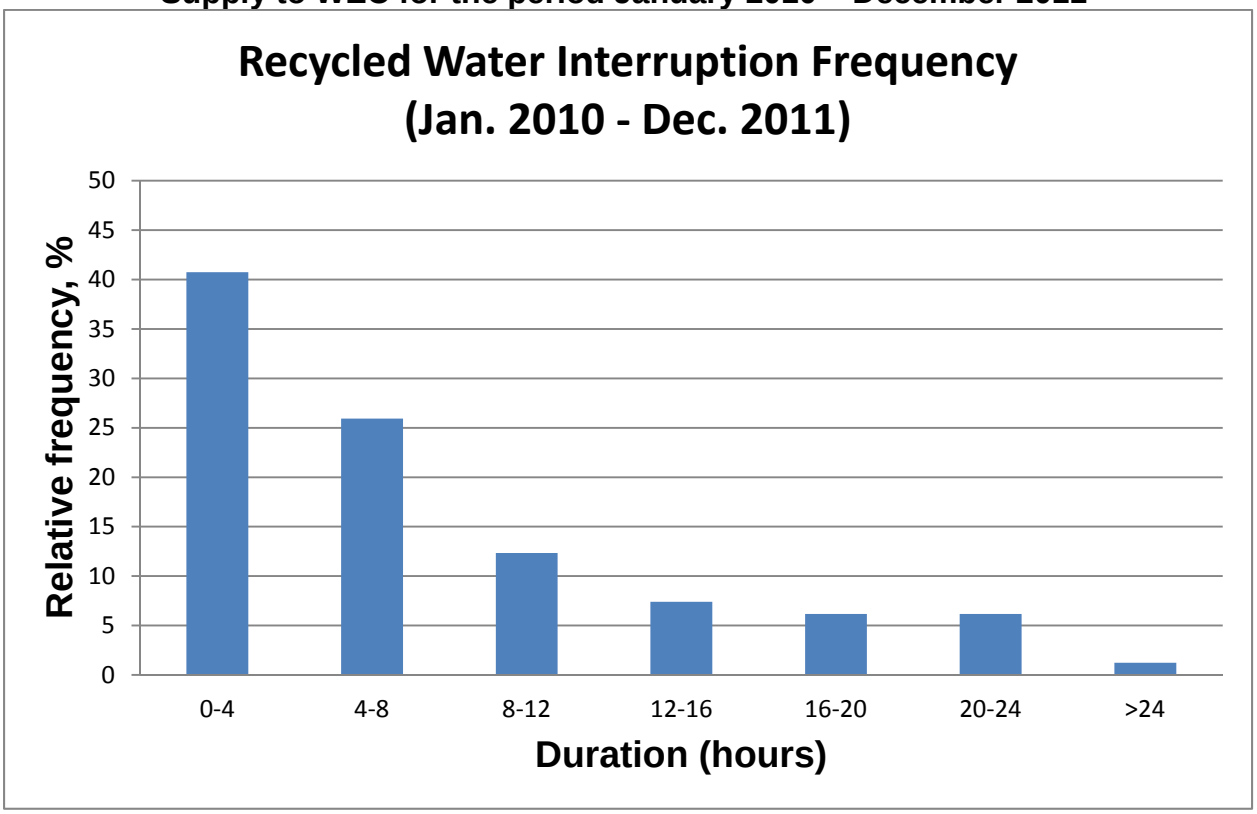
The effluent water from the City of Turlock's WWTP, less the portion delivered to the WEC, is discharged into the San Joaquin River according to the NPDES (National Pollutant Discharge Elimination System) permit issued by the Central Valley Regional Water Quality Control Board, CVRWQCB, (ORDER NO. R5-2010-0002; NPDES NO. CA0078948). The NPDES permit sets the criteria for the physical, chemical, as well as biological conditions that the recycled water has to meet before it is discharged into the San Joaquin River. In general, the limits for most of the constituents are based on the MCLs for those constituents. For example, the nitrates concentration in the effluent water cannot exceed the MCL of 10 mg/l.

According to the recycled water purchase agreement between the WWTP and the WEC, the WWTP can interrupt recycled water supply to the WEC in emergency situations such as when the effluent water does not meet CCR Title 22 requirements. Other emergency situations include low effluent flow conditions when influent water quality is beyond what can be handled by the WWTP, in which case the in-flow is routed away from the plant. An example of this rerouting occurs when the influent pH level is low, which can be detrimental to the biomedia of the active biological clarifier (ABC). If a pulse of in-flow is found to have low pH, that in-flow is routed away, causing a low effluent flow situation. However, although these situations may occur, according to the terms of the purchase agreement, the WEC will be the last customer to be curtailed.

Staff met with the City of Turlock staff on August 25, 2011 at the WWTP plant and discussed the recycled water delivery interruptions and if the City is implementing any measures to reduce the interruptions. Staff obtained data for the WWTP on the number and durations of recycled water interruptions to the WEC, as well as the causes of the interruptions. According to the data obtained from the WWTP staff, there have been 81 interruptions in the 24 months from January 2010 through the end of December 2011. Durations of the interruptions ranged from about 15 minutes to as long as 168 hours (6 days). The interruption durations were grouped into 4-hour intervals for frequency

analysis. The frequencies are depicted graphically in **Soil & Water Resources Figure 1**. About 41 percent of the interruptions lasted less than 4 hours, 67 percent of the interruptions lasted less than 8 hours, while roughly 80 percent lasted less than 12 hours. The median duration of the interruptions was 6.2 hours. There has been only one incident where the interruption lasted more than 24 hours, and that could have been due to high turbidity in the outflows caused by heavy rain that brought in a heavy load of fine material in the inflows to the WWTP.

Soil & Water Resources Figure 1
Duration and Frequency of Interruptions of City of Turlock WWTP Recycled Water Supply to WEC for the period January 2010 – December 2011



- Source: Compiled from data provided by Staff of Turlock Wastewater Treatment Plant.

As was explained by the WWTP Staff, interruptions are mostly due to recycled water turbidity, chlorine contact time (CT), or low effluent flow conditions. The trend from the data supplied by the WWTP staff showed that the frequency of interruptions related to CT has increased (almost doubled) from January 2011 through mid July in 2011 compared to 2010. According to WWTP staff, the measurements are very sensitive. This increase in frequency of interruptions is due to newly instituted, more stringent requirements set by the Regional Water Quality Control Board on measured CT in recycled water.

Since the end of July 2011, WWTP staff has been successfully implementing measures to reduce the frequency of interruptions. One such measure involves closely monitoring the influent to detect constituents that can cause abrupt fluctuations in the CT so that

they deal with them in a proactive way before they make their way to the processing units of the WWTP. Data provided by the WWTP staff did show a decrease in the interruptions between mid July and December 2011. Staff verified through personal communication in January 2012 with Steve Wilson, Turlock WWTP operator, that interruptions have continued to decrease through the end of 2011. The fact that WEC needed only 24 AF of water for backup for the 2011/2012 operation year, as reported in the most recent annual compliance report (WECA 2012), attests to the operational improvements achieved at the WWTP. Furthermore, reported interruptions from April 2012 through the second week of March 2013 also show that the frequency as well as duration of the interruptions have been consistently improving.

Staff has not received reports showing the actual durations of those recent interruptions, which is why those interruptions have not been included in the data for **Soil & Water Resources Figure 1**.

In addition to the measures that have already been successfully implemented at the WWTP to improve the situation of recycled water supply interruptions, the WWTP is embarking on a project to modify an equalization reservoir to store water in order to regulate the flow rate to the treatment plant to eliminate or reduce instances of diversions away from, or low flows into, the WWTP plant. The required modification involves installing a cover over the existing equalization reservoir to impede algal growth. The equalization reservoir will regulate the flow to the plant, and it will also act as a buffer to dampen fluctuations in influent turbidity and other water quality measures. Reducing or eliminating low flow episodes helps reduce fluctuations in CT, one of the crucial factors, if not the most crucial one, that led to the increase in frequency of interruptions of recycled water supply to the WEC observed in the first half of 2011. Completion of this expansion is contingent upon availability of funds.

The WEC uses a 500,000 gallon tank to store recycled water from the WWTP. The project owner informed staff that they cannot draw that tank below two thirds its volume for emergency reasons. Therefore one third of the tank (167,000 gallons) would be available for WEC's use for backup purposes. This volume of recycled water could supply 2 hours of WEC water demand at the maximum rate of 2 mgd. However, according to the original application for certification (WEC 2002), the average daily demand for the power plant is 1.4 mgd. At the average consumption, the available storage in the reservoir of 167,000 gallons should cover the project need for roughly 2.9 hours. At the average project consumption, the available water amount in the tank should be sufficient to supply the project water needs for more than 30 percent of the WWTP supply interruptions.

From the data supplied by the WWTP staff for the 24-month period from January 2010 to December 2011, about 70 percent of the events with the longest durations (56 events) averaged 12.5 hours in duration. Prorating the number of interruptions for a 12-month period results in 28 interruptions per year. If the storage tank supplies water for the first 2.9 hours of each interruption, the project would need to pump an amount of groundwater sufficient to supply the project for the balance of the duration beyond 2.9

hours, or 9.6 hours. Multiplying this by the average number of interruptions of 28 events per year, the total comes to 269 hours. The average hourly consumption is obtained by dividing 1.4 mgd by 24 hours, which comes to 58,333 gallons per hour (gph). Using the average hourly rate, the volume needed to be pumped from the groundwater aquifer would be 269 hours x 58,333 gph = 15.7 million gallons, or 48.2 AF. That is slightly under the 51 AF that the WEC is permitted to use in case of unexpected short duration interruptions in the 2005 amendment.

One might argue that the above calculations should be performed using the amounts of water the plant was licensed for. This would be reasonable since the design amounts that the project was licensed for assume some future conditions that are likely to happen. Repeating the above calculations using the 2 mgd design amount of water on a daily basis, the available water that can be used from the storage tank, or 167,000 gallons, should satisfy the needs of the first 2 hours of an interruption, as was discussed above. There are 22 percent of the events with durations less than or equal to 2 hours in the available record. Thus 78 percent of the events were longer than 2 hours in duration. The average duration of those 78 percent of events was 11.5 hours. The number of events was 64 in the 24-month period of the record. Adjusting this to an annual rate gives 32 events per year. If the available storage covers the first 2 hours of those events, water would be needed for 11.5-2.0=9.5 hours per event. Multiplying the number of events per year with the average duration water would be needed gives 304 hours. The hourly rate using the 2-mgd demand is 83,333 gph. Multiplying this rate by the total number of hours gives the total amount needed per year, which comes to 25.3 million gallons, or 78 AF. This amounts to about 4 percent of the maximum water demand of 1,800 AF that the project is licensed to use.

It should be noted here that the average durations used in the calculations above were skewed by an unusual event that lasted for 6 days, or 168 hours. WWTP staff explained that such a long event is rare and it is not clear why such events occur since they receive wastewater from a variety of industrial, residential, and commercial dischargers. If a discharger sends down a pulse of wastewater with high concentrations of a harmful constituent, it may lead to upsetting the characteristics of the whole influent flow thus causing the plant operators to redirect it away from the plant to avoid damage to sensitive biomedia. Therefore, such an event should not be included in the basis for characterizing routine interruptions, especially with the measures that the WWTP is implementing to eliminate circumstances that cause recycled water supply interruptions. If that one event is excluded from the data, the adjusted average duration of the longest 70 percent of interruptions would be 8.9 hours. Repeating the previous calculations using this average duration, the calculated volume comes to 56.5 AFY. Lastly, while the project was licensed for an average water use of 1.4 mgd, recent annual needs have been less than 1.0 mgd, making it likely that even less water would need to be pumped.

Staff acknowledges that the calculations performed above assume that the storage tank at the WEC is full at the beginning of an interruption. Since the WWTP produces almost ten times the volume needed by WEC, it does not have any limitation to supply the

power plant with any amount it needs on a daily basis, leaving it likely the storage tank will be full or be quickly refilled post-interruption.

The project owner questioned the lengths of recycled water interruptions and the cause of those interruptions (i.e., whether the supply interruption was caused by the WWTP being down, or by the power plant being down and asking the WWTP not to send recycled water over). After the project owner met with the WWTP staff some agreement was reached to change the cause of some of the supply interruptions to be attributed to the WWTP. The most severe outage that the WWTP staff agreed was their responsibility happened in January of 2011. Staff contacted the WWTP staff and was informed that since the WWTP staff did not indicate clearly the reason for the excessively long outages in January and February 2011, WWTP staff were willing to attribute the outage to issues at the WWTP. This revised the total length of outages for the months of January and February 2011 from 122 hours to about 422 hours. However, we believe that these were extreme events that were mostly due to the new regulations for chlorine contact time (CT) imposed on the WWTP by the water board and the WWTP was still in the process of adjusting its operations to cope with the new regulations. Therefore, it should not be included in the statistical analysis to determine an average year. It is obvious from the treatment plant's records that things have been brought under much better control after they had figured out how to handle the new water board regulations regarding CT.

WECA analyzed the same outage data from a different perspective that takes into consideration the run time of the power plant versus the lengths of the outages. WECA's analysis showed that the outage total durations for the past four years ranged from about 2.5 percent to about 12 percent. The 12 percent included the extra long and unusual outages of the months of January and February 2011. When staff excluded the unusual outages of those two months, the upper limit of the outage totals was only 8 percent.

In addition, the project owner wanted to add a margin of safety to the maximum outage total of the extreme year and conservatively assumed they would need 20 percent of their water use as back-up. Multiplying this outage duration with the maximum water volume the plant is permitted to use, or 1,800 AFY, they came up with a volume of 360 AFY of ground water for back up to meet the needs of the power plant during the interruptions. Staff finds this to be rather high and beyond what the data can reasonably support, as it compounds three layers of conservatism from the perspective of the power plant. Staff is willing to use the 1,800 AFY as the basis for the determination of the amount of water needed for back up, but not the 20 percent fraction of the time, especially that since its inception the power plant's water need has not exceeded 1,000 AFY in any year.

Using the project owner's approach to analysis, but excluding the outlier outages of January and February of 2011, staff believes that the more reasonable time fraction for the interruptions is 8 percent. Adding an even more conservative margin of safety of 25 percent, staff estimates a factor of 10 percent. Multiplying this10 percent factor with the

maximum water need of 1,800 AFY the plant is licensed for the total for back-up needs comes to 180 AFY. This estimate would be 2.5 times the amount of water that staff determined to be the back-up water need for times of recycled water supply outage based on the record for the past five years of operation and assuming the maximum daily water demand for the power plant.

LORS ANALYSIS

There are no new LORS that pertain to the proposed amendment, and the project, if amended, would comply with all LORS.

CONCLUSIONS AND RECOMMENDATIONS

The conclusion and recommendation are based on the following facts:

1- The WEC project was licensed to use up to 1,800 AFY of recycled water for cooling and process water. Since the WWTP did not come online until after the project commenced operations, the project was permitted to use potable water as a bridge supply until the WWTP became operational, and as a backup water supply.

2- In 2005, the project was amended to permit the use of up to 51 AFY of groundwater from the shallow unconfined aquifer in the project area as the bridge supply and as back-up in case of temporary interruptions in recycled water supply.

3- Groundwater resources in the project area are in overdraft condition. Also, groundwater quality in the deeper zones of the unconfined aquifer is suitable for domestic water needs - more than 600 wells draw water from the unconfined aquifer for domestic uses within a radius of 4 miles of the project. Increased pumping can enhance vertical movement of poorer quality water close to the ground surface, thereby degrading deeper water quality.

4- Due to the fact that interruptions of recycled water supply turned out to be more frequent than had been anticipated, the project owner believes that the 51 AFY is insufficient as a back up to meet the project water needs.

5- Frequency of interruptions increased from January 2011 through mid July 2011 due to more stringent chlorine contact time requirements imposed by the RWQCB.

6- The WWTP has been successfully implementing measures to reduce the frequency and duration of interruptions. The WWTP will also modify an existing reservoir to be used for equalization purposes, which should further reduce the frequency of interruptions, if not eliminate them all together.

7- The WEC uses a 500,000 gallon tank to store recycled water. The owner stated that only one third of the tank volume can be used since the tank cannot be drawn below two-thirds for emergency purposes. The available amount of water stored in this tank is sufficient to supply the project needs for 2 hours at the maximum project use

of 2 mgd. Based on statistical analysis of the record of interruptions for the 24–month period from January 2010 through December 2011, that covers about 30 percent of the normal interruptions.. WEC's back-up water needs for the last operation year of record was substantially less than the previous years since the project was amended to use ground water for back up purposes. Also, reports of interruptions for the period from April 2012 through the first half of March 2013 indicate that the interruption situation at the WWTP has continued to improve.

8- Under normal circumstances, the WEC needs to provide water for a total of 304 hours of operation per year, on average, using well water during WWTP supply interruptions beyond what is available in the on-site recycled water storage tank. At the maximum rate of 83,333 gph, corresponding to the hourly use based on the maximum project need of 2 million gallons per day, the total volume needed comes to about 77 AFY, which is about 1.5 times the 51 AFY that the project is permitted to draw from the wells. However, when the total annual outage durations were analyzed as a fraction of the run time of the power plant the maximum outage total was 8 percent, excluding the extremely unusual and controversial period in the months of January and February 2011. Adding a 25 percent margin for future uncertainty, this total fraction was adjusted by staff to 10 percent. Based on this fraction and the maximum water need of 1,800 AFY the project is allowed to use, staff determined that a volume of 180 AFY should be adequate to meet all project needs during recycled water outages. Therefore, staff recommends the 51 AFY be revised to allow up to 180 AFY of pumping from the three existing WEC wells. There are at least three levels of conservatism in favor of the project owner that were used in arriving at this volume.

In light of the facts above, Staff concludes that the amount of groundwater that the project was licensed to use in case of unexpected short-term interruptions has been insufficient to meet the project needs for back-up water in case of interruption in the supply of recycled water. Furthermore, the pumping zone of the unconfined aquifer likely has already been significantly degraded. If the groundwater pumping is limited at the WEC wells as proposed by staff then the potential for a significant cumulative impact to water quality would be mitigated. Therefore, staff recommends the increase of the amount of ground water allowed for the project as a back-up water supply in case of interruption in the supply of recycled water from 51 AFY to 180 AFY. To ensure the owner does not further degrade water quality staff has recommended changes to Condition of Certification **SOILS&WATER-5** as discussed below.

PROPOSED MODIFICATIONS TO CONDITIONS OF CERTIFICATION

Staff concludes that given the lack of groundwater quality data and the necessarily conservative assessment of potential for water quality impacts due to pumping of WEC wells, the increase in groundwater use must be limited to the minimum needed for dependable operation. Staff has presented results of different methods of analysis of the frequency and duration of interruption of the recycled water supply. Using staff's modification of the owner's method of analysis, staff recommends to go with the largest

amount that was computed, which is 180 AFY. This was based on the maximum outage for any of the past five years after excluding an extremely unusual period in January and February 2011, which was about 8 percent of the total run time of the WEC power project. Staff also added an additional margin of safety of 25 percent to the 8 percent to make it 10 percent. The 10 percent fraction of total interruption duration relative to the annual run time of WEC was then multiplied by the maximum volume of water the power plant was licensed to use, or 1,800 AFY, which came to 180 AFY as the total volume it can recommend for the plant to use to cover its needs during recycled water interruptions. In addition, staff concludes that the WWTP improvements that have been undertaken and the expansion of the equalization reservoir will significantly enhance the reliability of the recycled water supply. Staff recommends that **SOILS&WATER-5** be modified, as shown below, to reflect the increase in allowable back-up water use.

SOILS&WATER-5: The project's water use shall be limited as described below. For purposes of this condition, the bridge period is defined as that period of time between the start of commissioning operations of the WEC and the earlier of December 31, 2006 or when recycled water from the City of Turlock's wastewater treatment plant (WWTP) is available to the WEC.

Water for construction purposes shall consist of groundwater provided from the existing TID well at the Walnut substation. Potable water may also be used for construction for the purpose of hydrostatic testing and flushing of equipment, pipes and tanks; provided however, the project owner shall minimize the use of potable water for this purpose to the maximum extent feasible.

During the bridge period, water used for cooling and steam cycle make-up shall consist of poor quality groundwater from the upper aquifer supplied from either one or more groundwater wells located on the 69-acre parcel that includes the 18-acre WEC project site (the "69-acre Acre Parcel") or the two 100 percent wells located on the TID equipment storage area on South Washington Road (the "South Washington" site). Only one of the two groundwater wells may be operated at any time (with the other well serving as a 100 percent redundant backup). Total combined groundwater production from all of the wells on both the 69 Acre Parcel and the South Washington site shall not exceed two million gallons per day or 1,800 afy.

Water for operational and landscaping purposes used after the bridge period shall consist of recycled water from the City of Turlock WWTP and shall not exceed 1,800 afy. Water for domestic needs after the bridge period shall consist of potable water provided by the City of Turlock and shall not exceed 3 afy. Groundwater from the wells to be located either on the WEC project site 69-Acre Parcel or the South Washington site may also be used for back-up to the recycled water supply in the event of a short-term disruption in service and shall not exceed ~~51~~ **180** afy. Groundwater from the wells to be located either on the WEC project site 69-Acre Parcel or the South Washington site may also be used in the event that recycled water is not available to the project subject to

the provisions of **SOILS&WATER-6**. ~~Alternative~~ **Back-up ground**water use shall be calculated using a 5-year rolling average.

Verification: The project owner shall notify the Commission no later than May 31, 2006, and in monthly compliance reports thereafter, as to the status of recycled water production by the City of Turlock's WWTP until the WEC is using tertiary treated, recycled water for its non-potable operational and landscaping requirements. This notice shall include information on the issues related to recycled water production, DHS approval for recycled water service and the expected availability of recycled water supplies to WEC. After recycled water service is provided to WEC, the project owner shall report water use to the Commission as required by **SOILS&WATER-7**. Annual average water use shall be calculated using a 5-year rolling average of actual water use starting with the first year of operation. In the event of an interruption or reduction in recycled water service that requires the use of groundwater from the wells to be located on the 69-Acre Parcel or the South Washington site, the project owner shall notify the CPM, in writing, within 24 hours. **The notification shall include the time of the interruption, the cause of the interruption, and the expected duration of the interruption. Once recycled water becomes available for project use, the owner shall notify the CPM of such availability, even if the power plant was down and not receiving any recycled water.**

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